

BRITISH MUSEUM (NATURAL HISTORY)

THE
JOHN MURRAY EXPEDITION
1933-34

SCIENTIFIC REPORTS

VOLUME V, No. 9

ASCOTHORACICA
(CRUSTACEA, CIRRIPIEDIA)

BY

K. A. PYEFINCH, M.A.
(*University College, Nottingham*)

WITH TWENTY TEXT-FIGURES



LONDON:

PRINTED BY ORDER OF THE TRUSTEES OF THE BRITISH MUSEUM

SOLD BY

B. QUARITCH, LTD., 11 GRAFTON STREET, NEW BOND STREET, LONDON, W.1; DULAU & CO., LTD., 29 DOVER
STREET, LONDON, W.1; OXFORD UNIVERSITY PRESS, WARWICK SQUARE, LONDON, E.C.4;
H.M. STATIONERY OFFICE, LONDON, S.W.1

AND AT

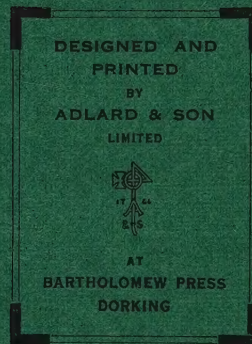
THE BRITISH MUSEUM (NATURAL HISTORY), CROMWELL ROAD, LONDON, S.W.7

1939

[*All rights reserved*]

Price Two Shillings

[*Issued 22nd July, 1939*]



ASCOTHORACICA

(CRUSTACEA, CIRRIPIEDIA)

BY

K. A. PYEFINCH, M.A.
(University College, Nottingham)

WITH TWENTY TEXT-FIGURES.

INTRODUCTION.

THESE parasitic Cirripedes have been recorded from a number of hosts, Zoanthidea, Antipatharia and Echinodermata, since the description of *Laura gerardiae*, from *Gerardia lamarecki*, by Lacaze-Duthiers in 1882. Norman (1888, 1913) has described *Synagoga mira*, an external parasite on *Antipathes larix*; Fowler (1889), *Petrarca bathyactidis* within *Bathyactis symmetrica*; Knipowitsch (1891), *Dendrogaster* within *Echinaster sarsi* and *Solaster papposus*; Djakonov (1914), *Ascothorax ophioctenis* within *Ophiocten sericeum*; Okada (1925), *Myriocladus* from *Asteroids* and Brattström (1936), *Ulophysema* from *Echinocardium cordatum*. Moreover, since the description of *Baccalaureus japonicus* by Broch in 1929, a number of descriptions of various species of this genus have appeared (Pyefinch, 1934, 1936, 1937; Brattström, 1936).

Most of these species have been founded upon a small number of specimens, so that the collections of Zoanthidea, Antipatharia and Echinodermata, made by the "John Murray" Expedition, presented a unique opportunity for the examination of a range of hosts, collected from one area, likely to contain these parasites. Unfortunately, only the Zoanthids contained any Ascothoracica, and all the specimens found may be included within the genus *Baccalaureus* (Broch). The complete list is as follows:

Baccalaureus japonicus (Broch).

B. disparcaudatus sp. nov.

B. verrucosus sp. nov.

B. digitatus sp. nov.

There were seven specimens of *B. japonicus*; two of *B. disparcaudatus*, and one each of *B. verrucosus* and *B. digitatus*. *B. japonicus*, the only species in the collection that was known previously, had not been recorded from the Indian Ocean, though related species have been described from the Maldives (*B. maldivensis*, Pyefinch, 1934), and from Madagascar (*B. argalicornis*, Brattström, 1936). The discussion of the relationships between the new species described in this report is continued later, after the description of the material examined.

Genus *Baccalaureus* Broch, 1929.

In the description of the species of this genus, the nomenclature adopted in the descriptions of *B. maldivensis*, *B. hexapus* and *B. torrensis* has been followed. That is, the elongated processes arising from the anterior end of the body are termed antennules, the plate-like structures at the side of the anterior end of the body are termed antennæ, and the appendages projecting backwards from the sides of the oral cone, the first pair of thoracic appendages. Yosii (1931) in his account of *B. japonicus* has adopted a different nomenclature, and in particular describes the last-named appendages as antennules. Brattström (1936) has followed Yosii's nomenclature in his description of *B. argalicornis*. The precise identity of all the structures mentioned above is still very much in doubt, so that the terminology adopted in the present instance is only tentative. On the other hand, there are inconsistencies in Yosii's description which make his identification of these various anterior processes and appendages doubtful. This point has been discussed previously (Pyefinch, 1936).

Baccalaureus japonicus (Broch). (Text-figs. 1-7.)

Baccalaureus japonicus Broch, 1929, 5 text-figs.; Yosii, 1931, 4 pls.

OCCURRENCE.—Sta. 105B, Zanzibar area, depth 238 m. Two specimens each within a polyp of a Zoanthid (not yet determined).

Sta. 106, Zanzibar area, depth 212 m. Five specimens. Two of these specimens occurred, side by side, within the same polyp, each of the remaining three specimens occurring alone.

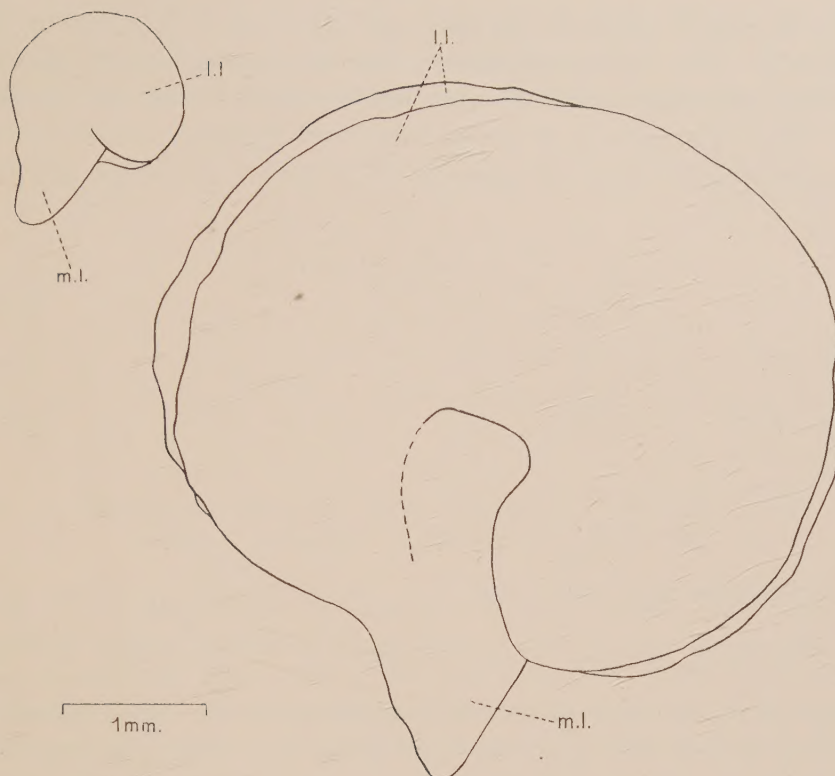
REMARKS.—All these seven specimens have been included within the species *japonicus*, though it is with considerable hesitation that they have been grouped together in this way. All the specimens agree with the published descriptions of this species in the following characters:

- (a) The degree of coiling of the lateral mantle lobes.
- (b) The number of thoracic appendages.
- (c) The number of terminal spines upon the rami of the caudal fork.
- (d) The extent and general form of the lateral chitinous ridge.

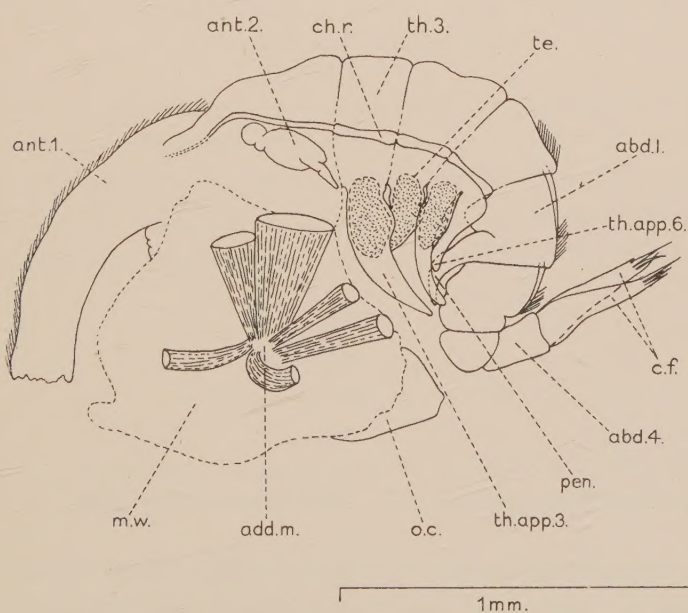
Of these four characters, only the second and third can be considered to be of any significance. In view of the lack of correlation between the degree of coiling of the lateral mantle lobes and the anatomy of the segmented body of these parasites (*vide* Pyefinch, 1937), the first character is only of general significance, whereas the fourth character is one which is general throughout the genus *Baccalaureus*.

The difficulty of precise identification is increased by the lack of uniformity in the descriptions given by Broch and Yosii. These differences are discussed below.

Both Broch and Yosii state that they were able to distinguish four thoracic segments, though these segments are not always clearly shown in the accompanying figures (*e. g.* Broch, fig. 5, p. 241). In the present instance only three thoracic segments were clear (Text-fig. 2). The arrangement of the appendages on these segments also differs in the two previous accounts. Yosii (1931) describes one pair of appendages as attached to each of the four thoracic segments, and this arrangement is also shown in his figures (pl. ix, fig. 4), but Broch (1929) draws the last two pairs of appendages as attached to the last thoracic

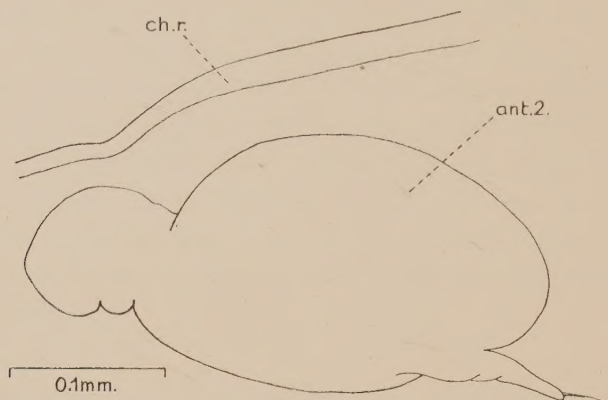


TEXT-FIG. 1.—*Baccalaureus japonicus* Broch. Whole specimens from the side, showing the degree of coiling of the lateral mantle lobes in a large and a small specimen. *l.l.*, lateral lobes of mantle. *m.l.*, median lobe of mantle.



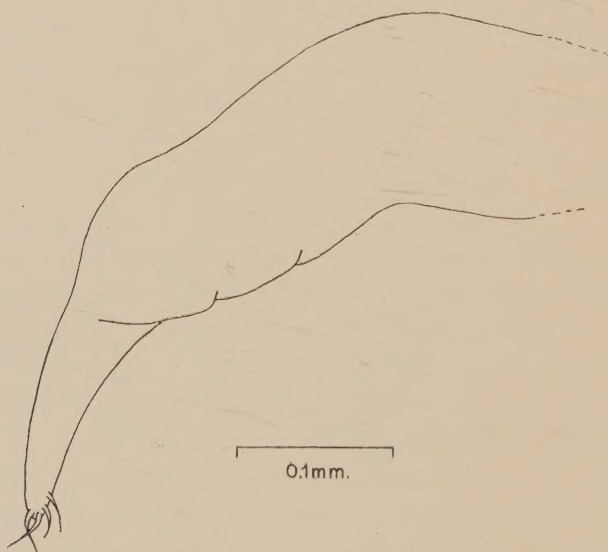
TEXT-FIG. 2.—*Baccalaureus japonicus* Broch. Segmented body from the left-hand side. (The "first thoracic appendage" is not shown.) *abd.1.*, *abd.4.*, 1st and 4th abdominal segments. *add.m.*, adductor muscle. *ant.1*, antennule (?). *ant.2*, antenna (?). *c.f.*, caudal fork. *ch.r.*, chitinous ridge. *o.c.*, oral cone. *pen.*, penis. *te.*, testis. *th.3*, 3rd thoracic segment. *th.app.3*, etc., thoracic appendages.

segment. This is clearly shown in his fig. 5 (p. 241), but is less clear in the preceding text-figure (p. 240). The Murray specimens here agree with Broch's description, as the last two thoracic appendages on each side are attached to the last thoracic segment. (Text-fig. 2.) Thus this segment probably represents segments 5 and 6 of the primitive thorax. The preceding two thoracic segments (4, 3) each bear a single pair of appendages.



TEXT-FIG. 3.—*Baccalaureus japonicus* Broch. Antenna (?) of the left-hand side. Lettering as before.

Each ramus of the caudal fork ends in three spine-like setæ, that situated towards the dorsal side being in each case the longest (Text-fig. 6). This arrangement agrees with that figured by Broch, but not with the figures given by Yosii, who draws the three setæ as being equal in length (pl. ix, figs. 4, 5).



TEXT-FIG. 4.—*Baccalaureus japonicus* Broch. Third thoracic appendage of the left-hand side.

In the present series of specimens setæ are present on the dorsal surface of the last thoracic segment and on abdominal segments 1 and 2, an arrangement agreeing with the description given by Yosii. Broch, however, in fig. 4 (p. 240), shows setæ on the last thoracic and first abdominal segments, but in fig. 5 they are drawn as present on the first two abdominal segments.

Both Broch and Yosii have described the plate-like structure lying near the chitinous

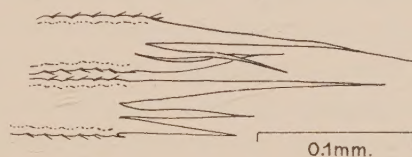
ridge at the anterior end of the body (blasenformige Anschwellung: fan-shaped appendage). In one of the present series of specimens this structure could be seen to end posteriorly in a finger-like process, with a single seta at its tip (Text-figs. 2, 3). A posterior



TEXT-FIG. 5.—*Baccalaureus japonicus* Broch. Posterior thoracic appendages. *a*, Fifth thoracic appendage. *b*, Sixth thoracic appendage.

process similar to this lateral structure has been described in *B. argalicornis* (Brattström, 1936) and in *B. torrensis* (Pyefinch, 1937).

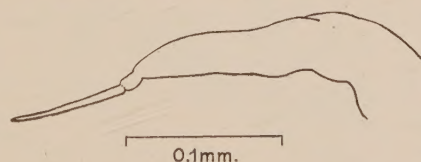
Projecting backwards, at the side of the oral cone, is a simple appendage, unjointed and with a spine-like tip. Broch does not describe any appendage as occurring in this position in his material, but Yosii described a jointed appendage, which he has termed the



TEXT-FIG. 6.—*Baccalaureus japonicus* Broch. Rami of caudal fork, showing arrangement of terminal spines.

antennule. As has been mentioned earlier in the present instance, this appendage has been termed first thoracic appendage (Text-fig. 7).

Nauplii were only present in one specimen (from Sta. 106). Yosii has described "frontal processes" as occurring in the nauplii of *B. japonicus*, but it was not possible to identify these in every nauplius in the present case. This series of nauplii further differed



TEXT-FIG. 7.—*Baccalaureus japonicus* Broch. First thoracic appendage of the right-hand side. Drawn from another specimen.

from those described by Yosii in their smaller size (0.27 mm. long by 0.18 mm. broad, as against 0.4 mm. long by 0.3 mm. broad).

In all the specimens examined, both large and small, the form of the lateral mantle lobes was much more rounded than that of the specimens described by Broch and Yosii. This difference is probably not of great importance, as the form of the mantle may well depend upon the position taken up by the parasite within its host. All the specimens in

this case were found within the coelenteron of the host Zoanthid, so that growth of the mantle might be expected to be regular.

Thus the characters in which the present series of specimens differ from *both* the earlier accounts are :

- (a) The form of the mantle lobes.
- (b) The dimensions of the nauplii.
- (c) The absence, in some cases, of "frontal processes" in the nauplii.

In view of the differences between the descriptions of *B. japonicus* given earlier and the present lack of knowledge of the validity of the specific distinctions made within the genus *Baccalaureus*, it would be unwise to place the present series of specimens in a new species on the basis of the differences enumerated above.

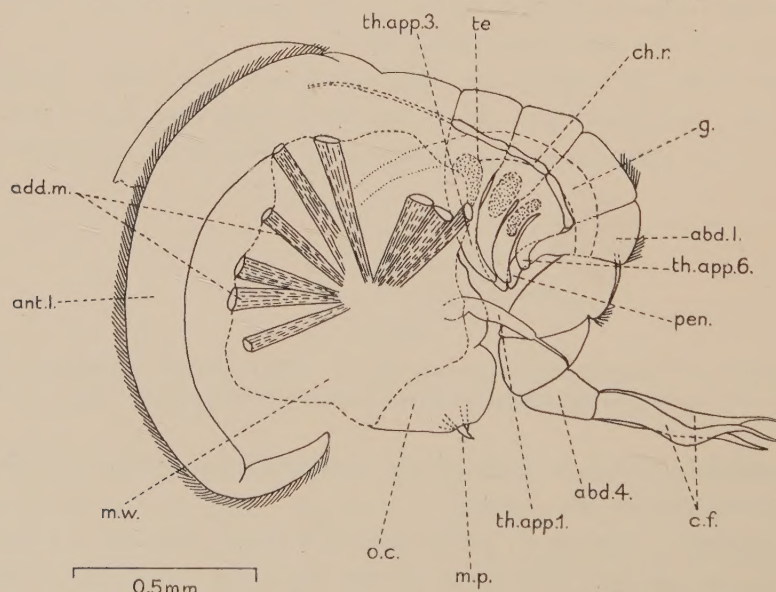
Since there is some doubt about the morphology of *B. japonicus*, text-figures have been included in this account (Text-figs. 1-7) showing details of external form, the segmented body, the thoracic appendages and of the rami of the caudal fork.

Baccalaureus disparcaudatus sp. nov. (Text-figs. 8-10).

OCCURRENCE.—Sta. 106, Zanzibar area, depth 183-194 m. Two specimens, both embedded transversely within the coelenteron of a single polyp of a Zoanthid (not yet determined).

DIAGNOSIS.—Mantle with median and lateral lobes, the latter slightly coiled. Tip of median lobe pointed. Segmented body with three free thoracic segments and four abdominal segments. Thoracic appendages uniramous and unsegmented; a single pair on each of the first two free thoracic segments, the last thoracic segment with two pairs of appendages. Dorsal setae present on the last thoracic and the first two abdominal segments. Penis on the ventral surface of the first abdominal segment. Biramous caudal fork, the upper ramus ending in three setae, the lower ramus curved and ending in a single large seta.

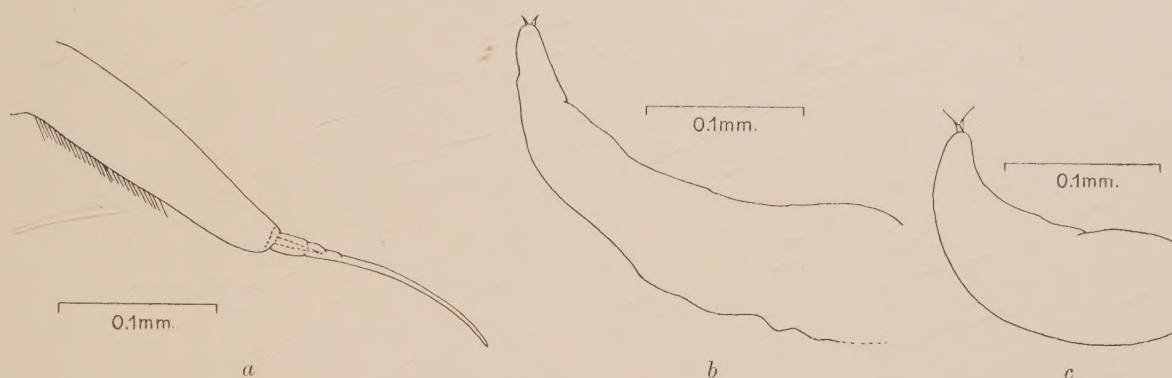
DESCRIPTION.—This species is closely allied to *Baccalaureus japonicus*, and in many



TEXT-FIG. 8.—*Baccalaureus disparcaudatus* sp. nov. Segmented body from the left-hand side. g., gut. m.p., mouth-parts. Other lettering as before.

respects it agrees closely with the descriptions given of the latter species, notably in the form of the mantle, the degree of coiling of the lateral mantle lobes, the form of the antennules (anterior processes), the number and arrangement of the thoracic appendages, the position of the dorsal setæ and the position of the penis.

It differs, however, in three respects. The form of the rami of the caudal fork is very distinctive. The upper ramus is normal in form, and ends in three setæ, of which

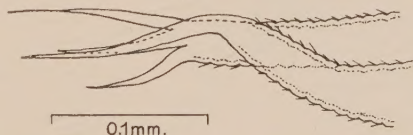


TEXT-FIG. 9.—*Baccalaureus disparcaudatus* sp. nov. Thoracic appendages. *a*, First thoracic appendage, left-hand side. *b*, Fourth thoracic appendage, right-hand side. *c*, Sixth thoracic appendage, right-hand side.

the dorsal is slightly longer than the other two, but the lower ramus bends upwards so as to overlap the upper ramus, and it ends in a single large spine (Text-figs. 8, 10).

The number of setæ on the thoracic appendages is also reduced and the setæ themselves are much smaller than those of *Baccalaureus japonicus* (Text-fig. 9 *a, b, c*. Compare Text-figs. 4 and 5).

Thirdly, no plate-like structure could be detected at the side of the anterior part of the thorax, although this region was carefully examined.



TEXT-FIG. 10.—*Baccalaureus disparcaudatus* sp. nov. Caudal fork.

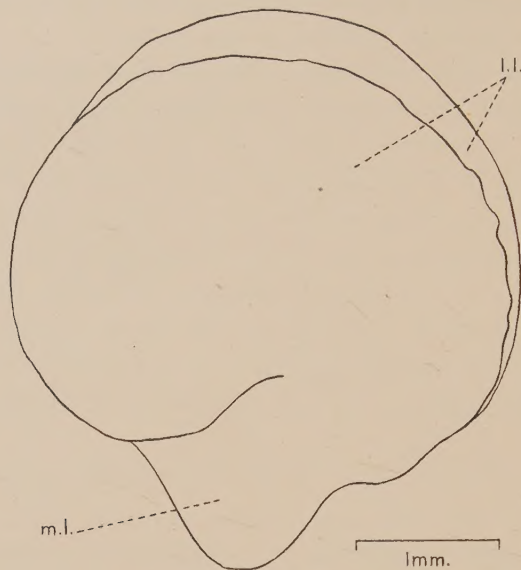
REMARKS.—The three differences outlined above seem sufficient to place these specimens in a new species, though it would appear likely that they are allied to *Baccalaureus japonicus*. The proposed name “*disparcaudatus*”, refers to the form of the rami of the caudal fork.

Baccaalureus verrucosus sp. nov. (Text-figs. 11–16.)

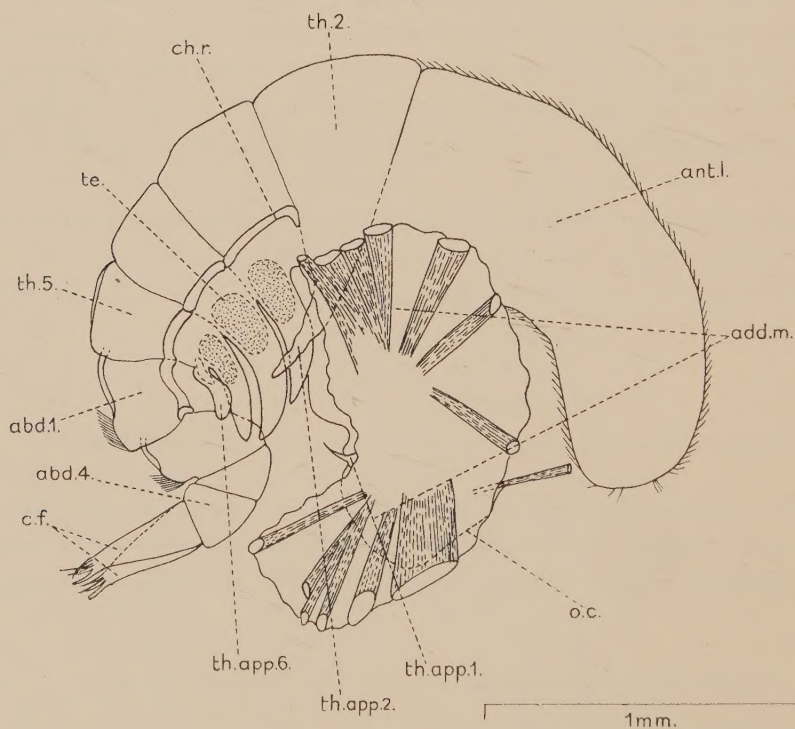
OCCURRENCE.—Sta. 122, Zanzibar area, depth 762 m. One specimen, from the stolon between two polyps of a Zoanthid (not yet determined).

DIAGNOSIS.—Mantle with median and lateral lobes, the latter slightly coiled. Surface of mantle lobes with well marked papillæ. Tip of median lobe broad. Segmented body with four free thoracic segments and four abdominal segments. Thoracic segments 2–4 (inclusive) each with one pair of uniramous, unsegmented appendages. Thoracic segment 5 with two pairs of appendages. Penis on the ventral surface of abdominal segment 2.

Biramous caudal fork, each ramus bearing four setæ, the lowermost of these being the stoutest. Dorsal setæ on abdominal segments 1 and 2. Anterior processes broad and short.

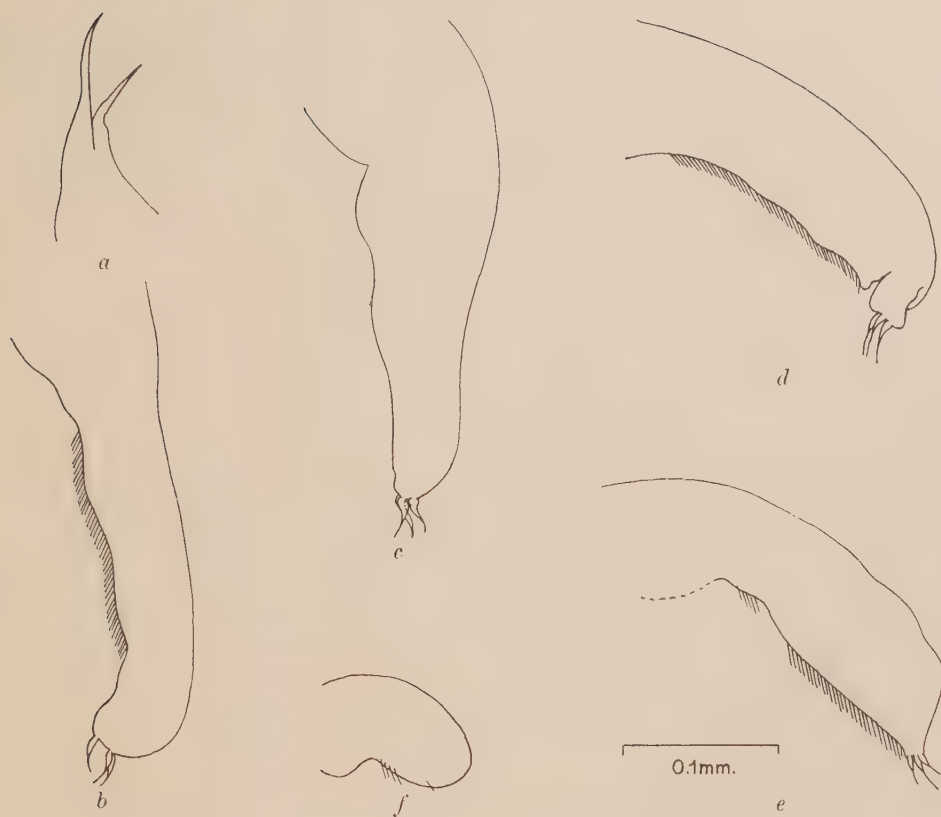


TEXT-FIG. 11.—*Baccalaureus verrucosus* sp. nov. Whole specimen. Lettering as before.

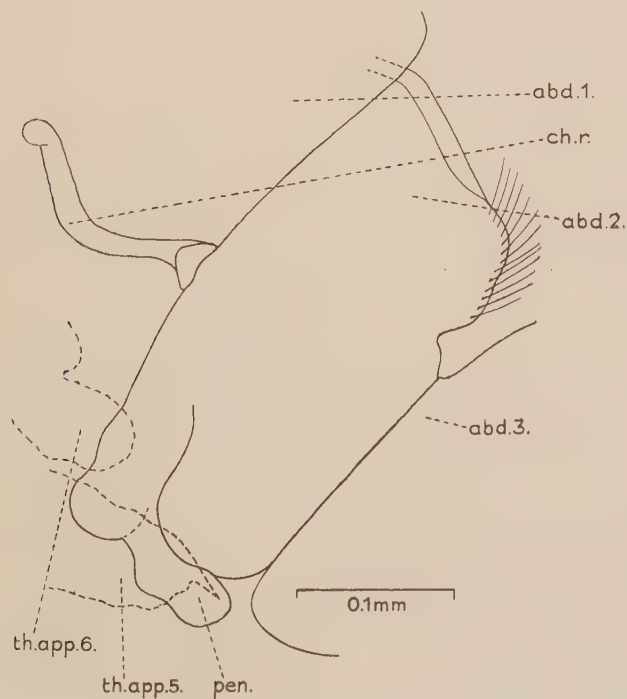


TEXT-FIG. 12.—*Baccalaureus verrucosus* sp. nov. Segmented body from the right-hand side. Lettering as before.

DESCRIPTION.—The most conspicuous features of the external appearance of this specimen are the globular shape of the mantle as a whole and the presence of large papillæ on its surface. The degree of coiling of the lateral mantle lobes approximates to that of *B. japonicus*, but the more globular form of the mantle is distinctive (Text-fig. 11). The

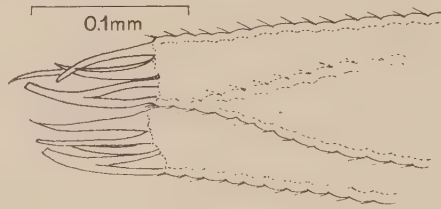


TEXT-FIG. 13.—*Baccalaureus verrucosus* sp. nov. Thoracic appendages. *a*, First thoracic appendage. *b*, Second thoracic appendage. *c*, Third thoracic appendage. *d*, Fourth thoracic appendage. *e*, Fifth thoracic appendage. *f*, Sixth thoracic appendage.



TEXT-FIG. 14.—*Baccalaureus verrucosus* sp. nov. Details of insertion of penis. Lettering as before.

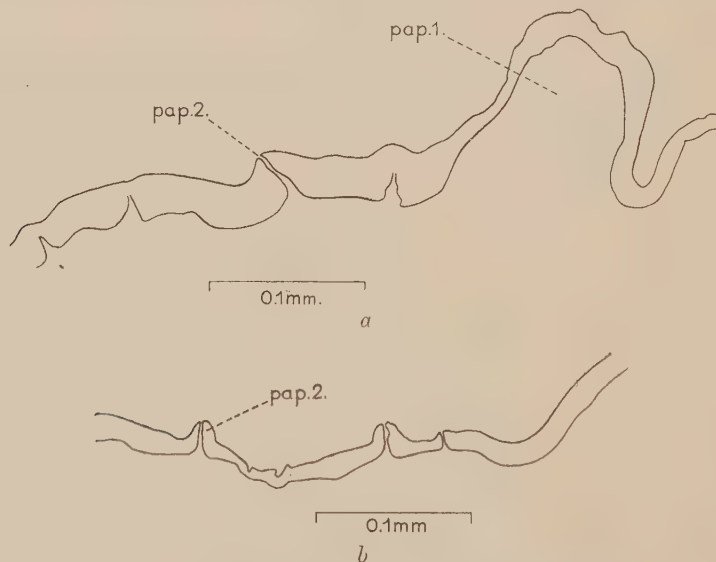
large papillæ which beset the surface of the mantle also contribute to this distinctive appearance. It would appear improbable that these papillæ are homologous with the papillæ found in other species of *Baccalaureus* since in section (Text-fig. 16a, *pap.* 1), they can be seen to lack the characteristic duct. The more normal type of papilla (Text-fig. 16a,



TEXT-FIG. 15.—*Baccalaureus verrucosus* sp. nov. Caudal fork.

pap. 2) lie scattered between these larger projections. The condition in this species may be compared with the more normal type of mantle wall (Text-fig. 16b).

The orientation of the segmented body within the mantle is similar to that of species previously described. The anterior processes (Text-fig. 12, *ant.* 1) are particularly short and stout, a condition presumably correlated with the globular form of the mantle. There is an oral cone of the usual form, at the side of which is a small appendage (Text-fig. 12, *th. app.* 1) projecting backwards. Owing to the mass of the adductor muscle, the proximal



TEXT-FIG. 16.—Mantle wall of *Baccalaureus verrucosus*, compared with that of a more normal species. *a*, *Baccalaureus verrucosus* sp. nov. *b*, *Baccalaureus disparcaudatus* sp. nov. *pap.* 1. large papillæ. *pap.* 2, smaller papillæ, pierced by a canal.

parts of this appendage could not be traced, but it ends distally (Text-fig. 13a) in two stout spine-like processes. The second to fifth thoracic appendages are, in several respects, similar. So far as could be made out, each ends in three stout setæ (Text-fig. 13b, *c*, *d* and *e*), and their posterior edges are clothed with a row of finer setæ. The sixth thoracic appendage is much smaller than those preceding, and lacks the terminal setæ. The second thoracic appendage projects backwards, overlapping appendages 3 and 4. Testes occur proximally on the third, fourth and fifth thoracic appendages. From the fact that the

last thoracic segment bears two pairs of appendages, it would seem that this represents the fused fifth and sixth segments of the primitive thorax.

The abdomen is of the normal form, the second segment bearing a stout penis in the mid-ventral line (Text-fig. 14). The general form of the rami of the caudal fork resembles that of other species of *Baccalaureus*, and their edges are beset with short setæ, set in shallow pockets of the integument (Text-fig. 15). There are, however, four terminal spines on each ramus, the ventral member of each series being the stoutest (Text-fig. 15).

The lateral chitinous ridge can be traced running along the side of the abdomen and thorax. Posteriorly it ends abruptly at the posterior edge of the first abdominal segment and anteriorly it cannot be traced further forwards than the anterior edge of the third thoracic segment.

REMARKS.—This specimen was found embedded within the stolon between two polyps, its position within its host being thus abnormal. The segmentation of the thorax and the arrangement of the thoracic appendages recalls the condition found in *B. torrensis* Pyefinch, 1937), but it cannot be suggested that the present specimen is closely allied to the latter species.

The specific name adopted for this specimen refers to the appearance of the mantle surface.

Baccalaureus digitatus sp. nov. (Text-figs. 17–20.)

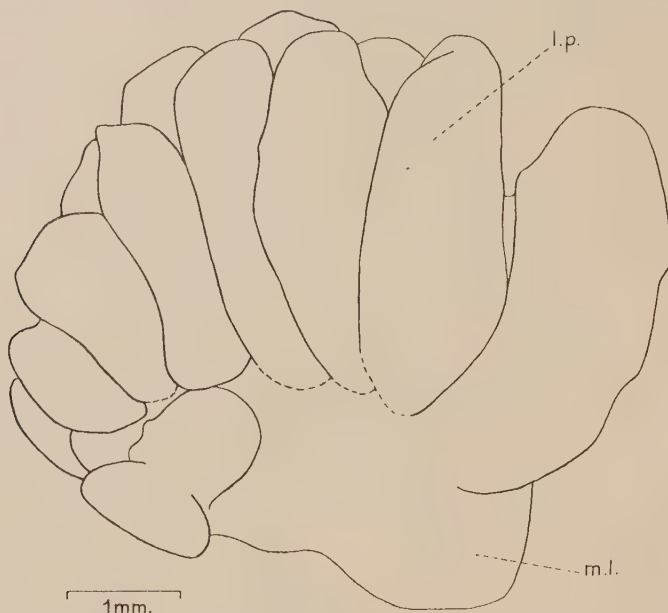
OCCURRENCE.—Sta. 184, Gulf of Aden, depth 1270 m. One specimen within a polyp of a Zoanthid (not yet determined).

DIAGNOSIS.—Mantle indistinctly divided into median and lateral lobes. The more median part of normal form, the more lateral part produced into eight pouches on each side. Segmented body large with four abdominal segments and six (?) free thoracic segments. At least three pairs of broad, uniramous, unjointed thoracic appendages, on segments 3, 4 and 5. Penis on the ventral surface of the first abdominal segment. Biramous caudal fork, each ramus probably bearing three setæ. Lateral chitinous ridge broad posteriorly, narrower anteriorly. Dorsal setæ present on the first abdominal segment and on all the thoracic segments. Anterior processes absent.

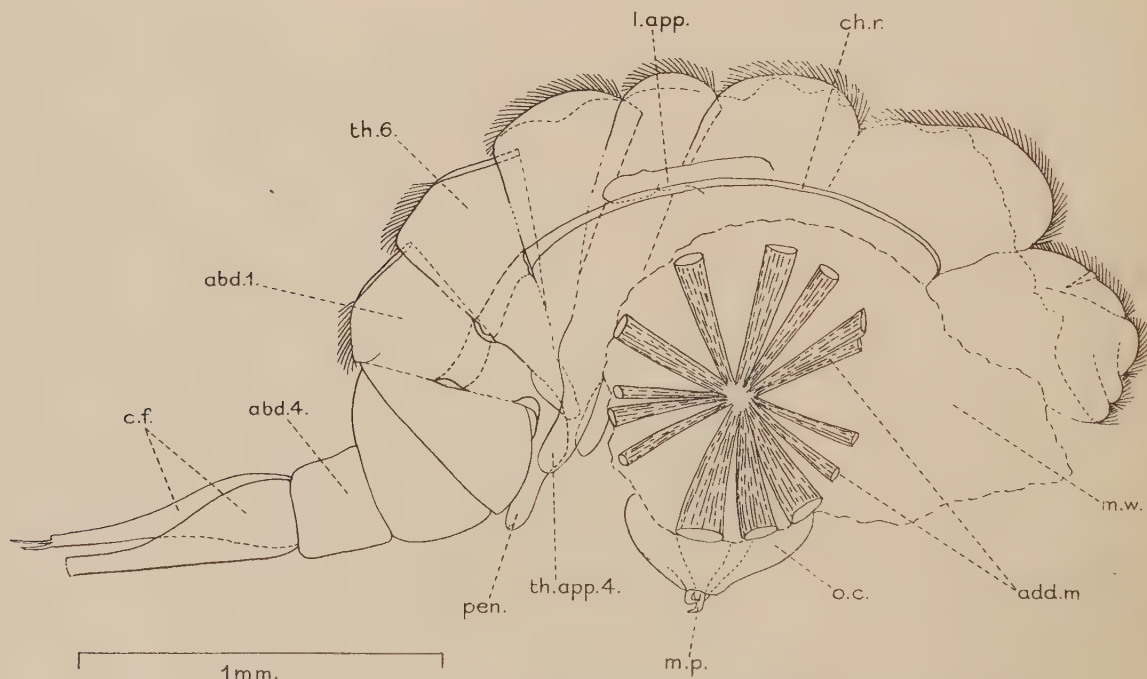
DESCRIPTION.—This specimen is especially distinct, as the form of the mantle differs radically from that of any other species of *Baccalaureus*. The median lobe is more normal in form but, instead of the coiled lateral lobes found in other species, the mantle is in this instance produced into eight paired pouches, the cavities of which are in free communication with the cavity of the median mantle lobe (Text-fig. 17). The segmented body lies within this mantle along its floor and it is attached to the latter by the adductor muscle (Text-fig. 18, *add. m.*). The orientation of the segmented body within the mantle is fundamentally the same as in other species of the genus, that is, the abdomen points towards the opening of the median mantle lobe (towards the right in Text-fig. 17).

The segmented body is much larger than that of any species previously recorded (roughly 3 mm. long), and is particularly characterized by the rounded appearance of the dorsal edges of the thoracic segments. There are no anterior processes (antennules), but there are irregular processes on the anterior edge of the most anterior segment (Text-fig. 18). It was not possible to determine whether this segment represented the first thoracic segment alone, or the first thoracic segment fused with the head. The second alternative

seems the more probable. The oral cone, projecting below the adductor muscle, is well developed (Text-fig. 18, *o.c.*), and projecting backwards at the side of the oral cone is an appendage which closely resembles the appendage termed 1st thoracic in other species



TEXT-FIG. 17.—*Baccalaureus digitatus* sp. nov. Whole specimen to show the characters of the mantle. *l.p.*, lateral pouch. Other lettering as before.



TEXT-FIG. 18.—*Baccalaureus digitatus* sp. nov. Segmented body from the right-hand side. *l.app.*, lateral appendage. Other lettering as before.

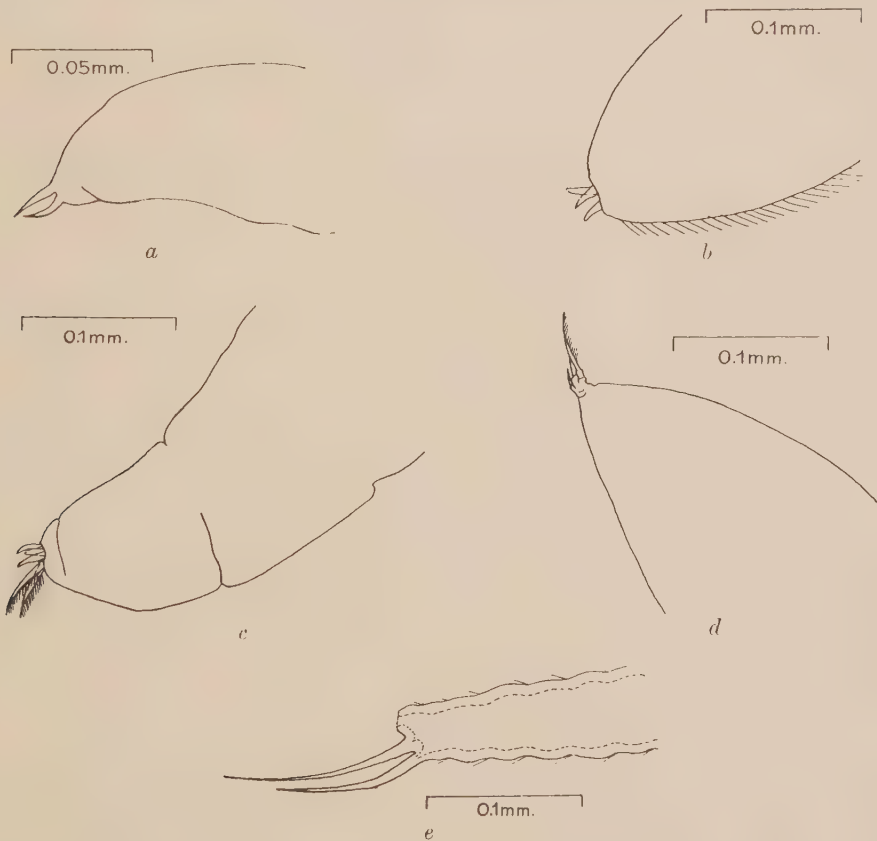
(Text-fig. 19; it is not shown in Text-fig. 18). It ends in a single, spine-like process. In this specimen it was possible to trace this appendage forwards nearly to the anterior edge of the oral cone.

Thoracic appendages could be distinguished with certainty only on segments 3, 4 and 5 of the thorax. No appendage could be found on segment 6. These appendages are



TEXT-FIG. 19.—*Baccalaureus digitatus* sp. nov. 1st thoracic appendage (?) of the right-hand side.

broad than those of other species, and their terminal setæ are generally better developed. Thoracic appendage 3 (Text-fig. 20*b*) bears three short, stout setæ terminally, but thoracic



TEXT-FIG. 20.—*Baccalaureus digitatus* sp. nov. Thoracic appendages and caudal fork. *a*, Lateral appendage of the right-hand side. *b*, 3rd thoracic appendage; right-hand side. *c*, 4th thoracic appendage; right-hand side. *d*, 5th thoracic appendage; left-hand side. *e*, Caudal fork, upper ramus.

appendage 4 (Text-fig. 20*c*) has two longer setæ in addition. These longer setæ bear a row of short spines along one side. Thoracic appendage 5, similarly, has two longer, spinous setæ, but only one of the shorter type of seta could be distinguished.

There is also an appendage which lies at the side of the thorax, immediately above the chitinous ridge (Text-fig. 18, *l. app.*). It is also broad and lobe-like and ends in two stout spines (Text-fig. 20a). It resembles the posterior process which arises from the "antenna" in *B. japonicus* (p. 251), *B. argalicornis* (Brattström, 1936) and *B. torrensis* (Pyefinch, 1937), but in this case, although the base of this appendage was carefully examined, no trace of the plate-like structure, which occurs in the species mentioned above, could be seen. This appendage could be traced back only as far as the third thoracic segment (Text-fig. 18), but it seems unlikely that this point really represents its actual point of insertion. The homologies of this appendage thus are uncertain.

The lateral chitinous ridge stretches from the posterior edge of the first abdominal segment forwards to the anterior edge of the second thoracic segment, where it ends abruptly. Posteriorly it is broad and rather ill-defined, but anteriorly it becomes narrower and is then sharply distinct. Dorsal setæ occur on every thoracic segment, as well as on the first abdominal segment.

The abdomen is more normal in form and consists of four segments, the first segment bearing the broad penis mid-ventrally (Text-fig. 18, *pen.*). The rami of the caudal fork are normal in form, but their tips were unfortunately damaged in removing the body from the mantle. However it seems probable that each ramus has three terminal setæ and, judging from the widths of the bases of these setæ, it is probable that the dorsal seta was the longest (Text-fig. 20e).

In section, the wall of the mantle was similar in structure to that of other species of the genus and, as in other cases, the outer surface of the parasite was covered with a layer of host tissue. The mantle cavity was full of nauplii, measuring 0.64 mm. long by 0.42 mm. broad. All these nauplii appeared to be in the same stage of development and all were still enclosed within the vitelline membrane. As it was found impossible to remove this membrane without damage to the appendages of the nauplii, it was not possible to determine the arrangement of the setæ on these appendages.

REMARKS.—The characteristic form of the mantle does not seem a sufficient reason for placing this specimen in a new genus, as in other respects (the form and characters of the segmented body) this specimen conforms to the diagnosis of the genus *Baccalaureus* (Pyefinch, 1937). Thus this specimen should be described as a new species of the genus *Baccalaureus*. The specific name "*digitatus*" is given with reference to the form of the mantle.

DISCUSSION.

In conclusion it is of interest to mention the geographical distribution, and briefly to discuss the status of the species detailed above. Since the description of *B. japonicus* from Japanese waters, several species of *Baccalaureus* have been described, some from the Indian Ocean, namely: *B. maldivensis* (Maldivé Is.), *B. hexapus* (Maungmagam, Burma), *B. argalicornis* (Madagascar), and *B. torrensis* (Torres Straits). The present material has extended the known range of *B. japonicus* into the Indian Ocean, and has added three new species, *B. disparcaudatus*, *B. verrucosus* and *B. digitatus* to those already known from this region. The genus *Baccalaureus* would thus appear to be widely distributed throughout the Indian Ocean.

With regard to the general distribution of the Ascothoracica collected by the expedition,

it is of interest to note that their general distribution follows that of other Cirripedes. Stubbings (1936), in his report on the Cirripedes, draws attention to the fact that Zanzibar and the Gulf of Aden are areas especially favourable for these Crustacea. All the Ascothoracica recorded come from these areas and the station mentioned by Stubbings (106, Zanzibar area) as being especially prolific contributed seven out of the eleven specimens of Ascothoracica which were found.

As has been pointed out previously (Pyefinch, 1934, 1936) the validity of specific distinctions within the genus *Baccalureus* is a matter of some doubt as, since the complete life history is as yet unknown, what are now regarded as specific differences may merely be due to differences in age of the specimens examined. This suggestion implies that degenerative changes, *e. g.* loss of thoracic appendages, loss of segmentation of the thorax, may take place during adult life. The specimens collected by the Murray Expedition do not, unfortunately, help materially in the solution of this problem. Of the material described in this report, *B. digitatus* certainly seems distinct, and *B. verrucosus* also has many distinctive characters, but *B. disparcaudatus* presents many points of similarity with *B. japonicus*.

In the light of this suggestion of adult degeneration, the inconsistencies in the original descriptions of *B. japonicus* may be important. Details of the segmented body of these Ascothoracica are not always easy to distinguish, but these inconsistencies may indicate a considerable range of variation in the two groups of specimens examined by Broch and Yosii, variations possibly correlated with differing ages.

Thus, until the complete life history of one species of *Baccalureus* has been fully worked out, the validity of the various species described must remain in some doubt.

Finally, it is interesting to note that these parasites may themselves harbour parasites. In two cases, once in one of the specimens of *B. japonicus* from Sta. 106, and again in one of the specimens of *B. disparcaudatus* from the same station, specimens of a parasitic Isopod were found within the cavities of the lateral mantle coils. Sac-like masses which may represent stages in the development of the female of this Isopod and smaller individuals, presumably the males, were found. A male specimen of the same parasite was also found attached to the outer surface of the mantle lobes of *B. verrucosus*. These hyperparasites, which will be more fully described in the report on the Isopoda of the expedition, are believed to be a new genus and species, belonging to the family *Cryptoniscidae*.

LIST OF REFERENCES.

- BRATTSTRÖM, H. 1936. *Ulophysema oresundense*, n. gen. et sp., eine neue Art der Ordnung Cirripedia Ascothoracica. Ark. Zool., Stockholm, XXVIIIa, No. 23, pp. 1-10, 2 figs.
- 1936a. *Baccalureus argalicornis*, n. sp., eine neue Ascothoracide aus Madagaskar. Kungl. Fysiografiska Sällskapets i Lund Forhandlingar, VI, No. 20, pp. 1-14, 4 figs.
- BROCH, H. 1929. *Baccalureus japonicus*, ein neuer Cirriped aus der Unterordnung der Ascothoracica. Mitt. Zool. Mus., Berlin, XV, pp. 237-43, 5 text-figs.
- DJAKANOV, A. M. 1914. *Ascothorax ophiocetenis*, n.g., und n. sp., eine neuer Endoparasit aus der Gruppe der Ascothoracidae. Vorl. Mitt. Travaux Soc. Nat. C.-r. Seances Petrograd, XLV, pp. 158-64 (Russian); 175-6 (German summary), 1 fig.
- FOWLER, G. H. 1889. A Remarkable Crustacean Parasite (*Petrarca bathyactidis*, n. gen., n. sp.). Quart. J. Micr. Sci. XXX, pp. 107-20, 1 pl.
- KNIPOWITSCH, N. 1891. *Dendrogaster astericola*, nov. gen. et sp., eine neue Form aus der Gruppe Ascothoracica. Biol. Zbl. X, pp. 107-11, 3 figs.

- LACAZE-DUTHIERS, H. DE. 1882. Histoire de *Laura gerardiae*. Type Nouveau de Crustacé Parasite. Mem. Acad. Sci., Paris, XLII.
- NORMAN, A. M. 1888. *Synagoga mira* (preliminary note). Rep. Brit. Ass. 1887 (1888), p. 86.
- 1913. *Synagoga mira*, a Crustacean of the order Ascothoracica. Trans. Linn. Soc. Lond. Zool. XI, pp. 161-5, 3 pls.
- OKADA, Yo K. 1925. Contribution a l'etude des cirripedes ascothoraciques. I. Note sur le *Dendrogaster arborescens* le Roi. Bull. Mus. Hist. Nat., Paris, XLIX, pp. 364-71, 2 figs.
- PYEFINCH, K. A. 1934. *Baccalaureus maldivensis*, a New Species of Ascothoracican. Quart. J. Micr. Sci. LXXVII, pp. 223-42, 14 figs.
- 1936. The Internal Anatomy of *Baccalaureus*, with a description of a New Species. Quart. J. Micr. Sci. LXXVIII, pp. 653-86, pls. 35-40, 9 text-figs.
- 1937. The Anatomy of *Baccalaureus torrensis* sp. n. (Cirripedia Ascothoracica). J. Linn. Soc. (Zool.), XL, pp. 345-71, 25 figs.
- STUBBINGS, H. G. 1936. Cirripedia. Scientific Reports of the John Murray Expedition, IV, No. 1, pp. 1-70, 30 text-figs.
- YOSH, N. 1931. Organization of *Baccalaureus japonicus* Annot. zool. Jap. XIII, pp. 169-87, 4 pls.

